

letters on the early shekels and those on the Moabite stone, and on the inscription of Esmunazar, there is in the case of some letters on the copper coins of the Asmonæan family, which are regarded as being but a few years later in date, a marked divergence. This is notably the case with the letters  $\eta$ ,  $\iota$ , and  $\psi$ ; and singularly enough these three letters revert to the forms employed on the silver shekels on some of the coins struck during the revolts, though the position of the letters is in some cases changed. Possibly the modification in the characters is due to their being so much smaller on the copper coins than on the silver. The persistence of the Phœnician or, as it may here be called, the Jewish or Samaritan character, is well exemplified by the legend on the shekel. It is of course retrograde, or to be read from right to left. The legend stands  $\text{L F Q W W L P W}$ , but when reversed, and the position of some of the characters slightly altered, it comes out as  $\text{S P L I S R A L}$ , in which  $\text{S P L I S R A L}$  can at once be seen, especially by eyes to which the Greek  $\Sigma$  and  $P$  are familiar.

Any notice of Mr. Madden's book would be incomplete without some reference to the Roman coins struck in commemoration of the Conquest of Judæa, of which excellent woodcuts are given. "Beneath her palm here sad Judæa weeps," while the captive warrior with his hands bound behind him, and his armour strewn upon the ground admirably typifies "How are the mighty fallen, and the weapons of war perished!" The sections devoted to money in the New Testament and to counterfeit Jewish coins will be read by many with interest, while the opening chapters on the early use of silver and gold, and on the invention of coined money, contain an excellent summary of our present knowledge. To the numismatist a work like the present is of special value, but we think that the ordinary student who neither knows nor cares in the smallest degree for coins as tangible objects for study or collection, will find much to reward him for a perusal of the non-numismatic parts of the volume, while to the theologian, and especially to the student of Jewish history, much of the information here contained is almost indispensable.

JOHN EVANS

#### THOMPSON'S LESSONS IN ELECTRICITY

*Elementary Lessons in Electricity and Magnetism.* By Silvanus P. Thompson, B.A., D.Sc., F.R.A.S., Professor of Experimental Physics in University College, Bristol. (London: Macmillan and Co., 1881.)

WE are glad to welcome a really admirable attempt to place before students the modern doctrines concerning electricity and magnetism in a popular but reasonably accurate form. The book begins with a rapid historical sketch of the long known facts on which it is the custom to dilate in every elementary text-book on electricity; but the historical statements indicate by little additional details that they have not been simply copied from the joint-stock property of text-book writers, but that some original authorities have been referred to. This portion of the book occupies the first 190 pages, and it does not call for special remark; the illustrations are, as a rule, familiar ones, but there is a very convenient magnetic map of England for 1888 as a frontispiece; and everything relating to the use of iron filings is well and

clearly put, as would naturally be expected. The author's statements of the well-worn facts are moreover interspersed with notes and characteristic touches which redeem them from dulness.

The second half of the book commences in Chap. IV. with the principle of electrostatic measurement and the definition of potential, which the author proceeds to apply to various cases; and he succeeds in giving the theory of attracted disk electrometers and of the capacity of condensers in a way which it is very satisfactory to find in so small a book. It is in the possession of this more strictly scientific information that the book differs from its predecessors in the same line, and we think the author has shown much ingenuity in contriving to pack into so small a compass not only all the ordinary popularly known facts, but also a considerable amount of more advanced science, which will be most acceptable to teachers and to students, who have long been accustomed to a great gap between mere experimental treatises on the one hand, and advanced mathematics on the other.

After the chapter on Electrostatics comes one on Electrodynamics and Magnetic Measurements, which is very well done, though necessarily too concise to be in all parts readily intelligible to a beginner. It contains a reference to Rowland's convection experiment and to Hall's effect. The chapter which follows, on Ohm's law, is perhaps the least satisfactory in the book. We are not satisfied with the statement of Ohm's law, nor with what is said concerning the meaning and measurement of resistance. Towards the end of the book comes a brief account of the Siemens' and Gramme machines, of Planté cells, of telegraphs, telephones, and the electric light. There is also a chapter on "Electro-Optics," which refers to Dr. Kerr's discoveries and to Maxwell's theory of light.

If it is necessary to say anything by way of general criticism, it is that the author sometimes shows a disposition to theorise a little too baldly, and to state without qualification, and with an air of certainty and completeness, views concerning the nature of electricity, which, though undoubtedly they have some truth in them, *i.e.* which certainly are steps towards the truth, yet have no finality about them, and which require to be cautiously worded and expressed lest they should mislead. For instance, his statements in the preface that "electricity is not *two* but *one*"; that, "whatever it is, it is not *matter* and not *energy*"; that "it may be heaped up in some places and will do work in returning to its former level distribution," are all, considered strictly, unjustifiable dogmas of the kind we have mentioned. A student ought to be puzzled by the unqualified statement "that more electricity can be made to appear at one place and less at another" when he has learnt from Maxwell that it always behaves exactly like an incompressible fluid of which all space is completely full. Neither are we altogether disposed to approve of the phrase "Conservation of Electricity," by which the author seems to set much store.

However, all these doctrines are immense improvements on the old forms of the fluid theory, and, being steps towards truth, will probably do far more good than harm. We are fully impressed with the necessity in teaching of getting *some* ideas into the heads of the students to begin with, and of polishing them up as much as possible afterwards.

On the whole, then, while we have not been able to find any statement which is certainly and distinctly wrong, we find a very great deal which is not only certainly and distinctly right but which is also exactly that concerning which a real student desires, but has hitherto been unable to obtain, information; and the whole is well and clearly written. We cannot therefore too strongly recommend teachers to adopt it at once as their text-book.

O. J. L.

#### OUR BOOK SHELF

*The Tea Industry in India; a Review of Finance and Labour, and a Guide for Capitalists and Assistants.* By Samuel Baildon, author of "Tea in Assam," &c. (London: W. H. Allen and Co., 1882.)

THE history of the discovery and introduction of what is generally known as Chinese tea, though often told, has a special interest to a very large proportion of the inhabitants of the civilised world. In every country, indeed, on the face of the globe, the people use some beverage which they know as tea, and which is prepared in a similar way to that in use amongst ourselves, namely, by infusion, and often, though made from the foliage of indigenous plants, having the same chemical properties as true tea. Considering the enormous money value the cultivation of the tea plant represents not only in this country, but in China and also in India, where it is continually extending, it follows that works on this special industry would meet with a wide circulation amongst planters, and managers and directors of tea companies, notwithstanding that books and papers on the subject are by no means scarce.

The work before us is one which, though containing a good deal of information on the practical working and financial aspects of tea planting is, moreover, written in a style that will be generally acceptable, especially among young planters, who have their way to make in the planting world, and who want the dry details or drudgery of a planter's routine of toil stated in a clear and at the same time easy manner.

We will not follow Mr. Baildon through all his chapters. A glance at the introduction will prove that his reason for writing the book has been to show that India is the country from whence we get the finest teas, and that it is also the country where we may look in future years for the bulk of our supply, holding out inducements, as many districts do, for the investment of capital and the application of bodily health and talent. In Chapter II., on "India the Home of the Tea Plant," quotations are largely made from the published works of well-known botanical authorities, to show that though cultivated from such a remote period in China that the plant is truly indigenous to India. The legends connected with the origin or discovery of the tea plant in China are told, one of which refers its discovery to the year of grace 510. The author points out that these legends do not prove that tea was discovered in a wild state in China. "The earliest mention," he says, "tells of people using it, and it may be inferred therefrom that they cultivated it. Precise and accurate information is obtainable as to the actual discovery of tea in Assam, away from habitations and in dense jungles far from 'cultivated grounds.' But similar information is not obtainable in connection with the first days of tea amongst the Chinese."

Referring to the altered character of certain districts in India now under tea cultivation, Mr. Baildon says, "Where once jungle and its deadly miasma concealed the riches and importance of the province, hundreds of thousands of acres of open land are now to be seen planted with tea. Compared with past times Assam is no longer a howling wilderness, and the change from hundreds of miles of waste into cultivated land has altered almost everything."

In proof of the superiority of Indian over China teas, the author advances many arguments and anecdotes of a powerful nature, which, however, may be summed up in the simple statement "that it is systematically used to fortify tea from China," and that there is only one case on record of anything approaching adulteration of Indian tea. It is stated that "every pound offered for sale in England can be guaranteed as absolutely pure," and this is its reputation with the trade. Mr. Baildon's statements on this head are, we believe, an honest record of facts, for it is well known that Indian teas are largely used in this country for mixing with inferior China teas. This system is well known as "blending," and is stated to be resorted to because the public taste has not yet become educated to the flavour of Indian teas alone. The English tea drinker, however, is rapidly assuming a taste for the Indian produce, and the demand for Indian tea is already very great.

On the question as to the kind of men likely to succeed as tea planters in India, Mr. Baildon has a great deal to say, and is very outspoken in what he does say. His estimate of a successful planter is evidently drawn from a thoroughly practical experience, and will no doubt serve to encourage some, as it will to discourage others.

The book has been carefully revised, and is unusually free from blunders, the author wisely omitting to go into the botanical character of the tea plants any more than a reference to the names under which the forms have been described.

*A Treatise on the Theory of Determinants; with Graded Sets of Exercises for Use in Colleges and Schools.* By T. Muir, M.A., F.R.S.E. (London: Macmillan, 1882.)

THERE has been a tendency of late among some of our mathematical writers to specialise their labours; thus, Dr. C. Taylor has confined his work chiefly, if not mainly, to the geometry of conics; and our present author, to the subject of determinants. This is, we think, a good practice. Mr. Muir is no novice, and has done good work in this field, much of which is original. We have long desiderated some such work as this. Mr. Scott's is very able, but we cannot but think it is hard for junior students. Mr. Muir, we are disposed to believe, has made the introduction to the subject easier for this class, at the same time that he brings before the reader all that could be expected in a text-book. The work before us consists of three chapters, the two first of which do not err on the side of brevity; but this fulness serves a purpose, viz. "that the reader may become thoroughly familiarised with the definition," which, by the way, is too long for us to reproduce here. Though the enunciation is long, the idea is easily grasped, and when taken in connection with the illustrations, is not likely to give much trouble to the student to master it. These chapters, as indeed the remaining one also, are copiously illustrated by graduated exercises. The third chapter is much more condensed in style, and treats of determinants of special form, viz. continuants, alternants, symmetric determinants, Skew determinants, and Pfaffians, compound determinants, and determinants whose elements are differential coefficients of a set of functions, to wit Jacobians, Hessians, and Wronskians.

In a final chapter is given an interesting historical and Bibliographical Survey, from which the reader learns that contributions have been made to the subject from the publication of the germinal idea (long unfruitful) by Leibnitz in 1693, down to this present work. We may refer for further information to the chronological "List of Writings on Determinants" (1693-1880), published by Mr. Muir in the *Quarterly Journal of Mathematics* for October, 1881. This, the completest list we have seen, was to have formed part of the present work. Though we have carefully read the book through, with the exception of the exercises, we have detected but three or four